

Diet composition of young-of-the-year damselfish, *Chromis chromis* (Pomacentridae), from the eastern Adriatic Sea

by

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RÉSUMÉ. - Régime alimentaire des juvéniles de *Chromis chromis* (Pomacentridae) en mer Adriatique orientale.

Le contenu stomacal de 554 castagnoles juvéniles *Chromis chromis* (Linnaeus, 1758) a été analysé pour évaluer la composition du régime alimentaire. Le matériel a été collecté dans des localités de l'archipel de Kornati en Adriatique centrale orientale au cours de l'année 2000. Cinq groupes principaux de proies peuvent être distingués : Ostracodes, Copépodes, Polychètes, Cirripèdes (larves non identifiées) et Cladocères. Ostracodes et Copépodes constituent la majeure partie de la nourriture, avec 59,81% de l'index d'importance relative (IRI), suivi des Polychètes et des Cirripèdes avec 21,82% et 15,82%, respectivement. L'activité alimentaire était élevée comme le reflètent le grand degré de remplissage des estomacs et la faible valeur de l'indice de vacuité.

Key words. - Pomacentridae - *Chromis chromis* - MED - Adriatic Sea - Juveniles - Diet.

Chromis chromis (Linnaeus, 1758) is a small pomacentrid found in the Mediterranean and from Portugal southwards to Angola. It is abundant in eastern Adriatic and forms a small but significant component of a small-scale fishery at Dalmatia where it is used as food and bait for lobsters. There are no statistics on catch, but Jardas (1996) reported it is around 30 tonnes per year.

Published information on its biology and ecology is limited despite its distribution. The purpose of this study was to provide a quantitative description of the diet of the young-of-the-year (YOY) *Chromis chromis* from the eastern central Adriatic Sea.

MATERIALS AND METHODS

The specimens of *Chromis chromis* were collected at Kornati Archipelago (eastern central Adriatic) (43°50'N-15°20'E, 43°50'N-15°22'E, 43°50'N-15°17'E, 43°50'N-15°24'E), using a small beach seine made especially for the collection of juvenile fish. The net was 50 m long and 30-170 cm deep, with a cod end mesh size of 4 mm. Samples were taken during daylight hours at 0-5 m depth. A total of 554 specimens were collected throughout the year 2000. Total length (TL) ranged from 8 to 65 mm. All specimens belonged to 0+ or 1-year age groups. Total length was measured to the nearest 0.1 cm, and weight to the nearest 0.01 g. Upon measurements, whole specimens were fixed in 4% formalin solution. Prey identification was carried out to the lowest possible taxonomic level. Inorganic matter and detritus were excluded from the analysis. Wet weight of food items was registered to the nearest 0.01 g, after removal of surface water on blotting paper.

Dietary indices used in the present study were:

1. Percentage frequency of occurrence (%F), i.e. the number of stomachs in which a food item was found, expressed as the percent-

age of total number of non-empty stomachs.

2. Percentage numerical abundance (%Cn), i.e. the number of prey item in all non-empty stomachs in a sample, expressed as the percentage of total number of food items in all stomachs in a sample.

3. Percentage weight composition (%Cw), i.e. the wet weight of each prey item, expressed as the percentage of total weight of stomach contents in a sample.

4. Vacuity index (%VI - the percentage of stomachs which were empty), and fullness index (%Jr - weight of digestible prey/fish weight x 100) (Hureau, 1970).

5. The main food items were identified using the index of relative importance (IRI) as modified by Hacunda (1981): $IRI = \%F \times (\%Cn + \%Cw)$. Prey importance is expressed as percentage of cumulative IRI.

RESULTS

Frequency, abundance, biomass and IRI values of prey organisms found in the stomachs of *Chromis chromis* are shown in table I. With respect to %IRI, five main groups of prey may be distinguished: Ostracoda, Copepoda, Polychaeta, Cirripedia (unidentified larvae) and Cladocera. Ostracoda and planktonic Copepoda constituted the bulk of food content making up as much as 59.81% of the total IRI, followed by Polychaeta and Cirripedia with 21.82% and 15.82%, respectively. Cladocera, Decapoda (unidentified larvae) and Amphipoda (unidentified larvae) are less important in the food of damselfish during their first year of life. As a result of the degree of digestion of the prey, the determination to the level of species often was not possible. However, at species level, the copepods *Clausocalanus pergens*, *Clausocalanus furcatus* and *Ewadne tergestina* of the Cladocera group were the most abundant.

Feeding intensity was measured by stomach %VI and %Jr. Out of 554 analyzed stomachs only 16 were completely empty (%VI = 2.89). The coefficient of gut fullness was high (%Jr = 10.30).

DISCUSSION

This study indicates that the YOY *Chromis chromis* living in the eastern central Adriatic are exclusively carnivorous. Main prey types (representing 50% or more of total IRI) are planktonic Ostracoda and Copepoda. However, Polychaeta were nearly as important as Copepoda. Cirripedia and Cladocera were secondary food, whereas Decapoda and Amphipoda were of minor importance. Preferences on the planktonic nature of prey may be related to mid-water habits of damselfish. It could also be found above or near rocky reefs or above sea grass (*Posidonia*) meadows at depth ranging from 3 to 35 m.

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Table I. - Diet composition of young-of-the-year (YOY) damselfish *Chromis chromis* (N = 554). (%F, frequency of occurrence in fish guts, expressed as percentage of non-empty stomachs; %Cn, percentage numerical composition; %Cw, percentage weight composition). [Composition du régime alimentaire des alevins de moins d'un an des castagnoles *Chromis chromis* (N = 554). (%F, indice de fréquence des proies dans le tube digestif, exprimé en pourcentage des estomacs non-vides; %Cn, pourcentage de la composition en nombre; %Cw, pourcentage de la composition en poids).]

Food items	%F	%Cn	%Cw	%IRI
Polychaeta	34.3	7.7	30.5	21.82
Ostracoda	38.9	27.4	19.5	30.38
Copepoda				
<i>Clausocalanus pergens</i>	36.8	23.1	5.3	17.40
<i>C. furcatus</i>	21.1	15.2	3.4	6.54
<i>C. tenuicornis</i>	19.0	10.5	2.4	4.08
<i>Eucalanus elongatus</i>	10.5	5.0	1.2	1.08
<i>Acartia clausi</i>	7.4	2.1	0.5	0.32
Total Copepoda	25.72	55.9	12.8	29.43
Cladocera				
<i>Ewadne tergestina</i>	50.0	0.77	0.57	1.12
<i>Ewadne spinifera</i>	9.7	0.17	0.13	0.05
<i>Podon</i> spp.	50.0	0.60	0.45	0.88
Unidentified Cladocera	97.01	6.65	4.90	0.19
Total Cladocera	9.42	8.19	6.05	2.23
Cirripedia (unidentified larvae)	82.08	2.05	9.53	15.82
Decapoda (unidentified larvae)	9.70	0.08	0.18	0.05
Amphipoda (unidentified larvae)	8.95	0.10	1.72	0.27

Feeding intensity is positively related to the degree and index of fullness, and negatively related to the percentage of empty stomachs (Bowman and Bowman, 1980). The low values of the %VI and increased values of fullness index indicate that feeding intensity is high throughout the sampling period. The coefficient of gut fullness from this study was (0+ or 1-year age groups) much higher (%Jr = 10.30) than those calculated for larger damselfish (%Jr = 3.80) (Dulčić, 1995). This is in agreement with the general statements that a higher feeding intensity frequency is more pronounced in smaller individuals (Grove and Crawford, 1980).

Results from this study are generally in accordance with the observations of Duka and Shevchenko (1980) off the Mediterranean coast of the Island of Lampedusa and (juvenile and adult stages together without separating) from the Black Sea. These authors found that copepods (Calanoida and Cyclopoida) followed by Appendicularia (*Oikopleura dioica*) were important food in the Mediterranean, and that damselfish eggs and Appendicularia were the most abundant food items in the Black Sea. As no quantitative

data on prey consumption of damselfish were given, it is not possible to compare the data on that basis. Mapstone and Wood (1975) revealed that *Chromis chromis* in the Azores feeds both on planktonic and benthic organisms; eight out of 11 individuals contained predominantly planktonic and three predominantly benthic organisms. Variation in prey importance among these studies may be related to differences in prey availability among regions.

The fact that stomach contents showed only planktonic stages of crustaceans seems to be related to the small size of their mouth opening (Dulčić, 1995). *Clausocalanus* species are small-size epipelagic organisms, which inhabit surface waters (Gamulin, 1979), explaining the dominance of *Clausocalanus pergens* and *C. furcatus* in the stomach of YOY damselfish. With the growth of the fish the size of the mouth increases. This enables the catch of larger and more diverse prey, and has been confirmed for damselfish by Duka and Shevchenko (1980) from Black Sea.

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